Effect of inorganic fertilizers and bio-fertilizers on growth, yield and quality of tomato (Lycopersicon esculentum Mill.)

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ABSTRACT

A field experiment was carried out during summer season of 2013 and 2014 to find out the effect of inorganic and bio-fertilizers on the growth, yield and quality of tomato (Lycopersicon esculentum Mill.) cv. Pusa Hybrid -2. The results revealed that plants growth and yield of tomato can be increased with the application of Azospirillum along with recommended dose of NPK (120kg N + 60kg P + 60kg K/ha). The ascorbic acid content of fruits were found maximum with the 80kg N + 40kg P + 60kg K/ha with Azospirillum. The TSS was improved by the application of 80kg N + 40kg P + 60kg K/ha with Phosphobacteria.

KEYWORDS

Tomato, Azospirillum, Azotobacter, Phosphobacteria, Inorganic fertilizers

Tomato (Lycopersicon esculentum Mill.) is one of the most common and principal vegetable crops which is grown in India and other parts of the world. It can be grown in almost all part of country except higher altitudes, all the year round. In India, according to FAO estimates, tomato grown in 0.52 million ha, its production is 7.4 million tones and productivity is 15.13 t/ha. Realizing the role of bio-fertilizers in the present day intensive agriculture through bio-fertilizers such as Azospirillum, Azotobacter, Phosphobacteria has been identified and applied to commercial tomato cultivation. These bio-fertilizers individually and with inorganic fertilizers improve the vegetative growth, yield and fruit quality of tomato. Keeping these objectives in view, the present investigation was carried out to study the effect of inorganic and bio-fertilizers on the growth, yield and quality of tomato crop.

MATERIALS AND METHODS

The experiment was conducted during 2013 and 2014 at Krishi Vigyan Kendra, Muradnagar, Ghaziabad under the S. V. P. University of Agriculture and Technology, Meerut (UP). The experiment was laid out in “factorial randomized block design” with three replications. The experiment consisted 16 treatments of inorganic and bio-fertilizers. There are four bio-fertilizer treatments *i.e.* B₀, B₁, B₂, B₃ (B₀=no bio-fertilizers, B₁=Azotobacter, B₂=Azospirillum and B₃=Phosphobacteria) and four inorganic fertilizer treatments *i.e.* N₀, N₁, N₂, N₃ (N₀=no inorganic fertilizers, N₁=40 kg N + 20 kg P/ha, N₂=80 kg N+ 40 kg P/ha, N₃=120 kg N + 60 kg P/ha). The seedlings of tomato cv. Pusa Hybrid -2 were spaced at 60. 60 cm. A basal dose of phosphorus (20, 40 and 60kg/ ha) and potassium (60kg/ ha) along with fifty percent nitrogen as per the treatment was applied at the time of field preparation. Remaining dose of nitrogen was top dressed after 30 and 45 days of transplanting. Carrier based inoculants (Azotobacter, Azospirillum and Phosphobacteria) were used as seedling treatment @ 1.0kg/ ha. Observations were recorded as plant height, number of primary branches, days taken to first flowering.
<table>
<thead>
<tr>
<th>Treatments</th>
<th>Plant height (cm)</th>
<th>No. of primary branches</th>
<th>Days taken to first flowering</th>
<th>No. of fruits/plant</th>
<th>Avg. yield (q/ha)</th>
<th>TSS (%)</th>
<th>Ascorbic acid (Mg/100ml)</th>
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</thead>
<tbody>
<tr>
<td>Bio-fertilizers</td>
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<tr>
<td>B₀ (No Biofertilizers)</td>
<td>78.09</td>
<td>78.02</td>
<td>7.83</td>
<td>7.83</td>
<td>37.33</td>
<td>37.75</td>
<td>24.98</td>
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<tr>
<td>B₁ (Azotobacter)</td>
<td>86.90</td>
<td>87.19</td>
<td>8.93</td>
<td>9.08</td>
<td>35.38</td>
<td>34.98</td>
<td>33.80</td>
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<tr>
<td>B₂ (Azospirillum)</td>
<td>87.84</td>
<td>87.74</td>
<td>9.26</td>
<td>9.25</td>
<td>35.21</td>
<td>34.91</td>
<td>33.86</td>
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<tr>
<td>B₃ (Phosphobacteria)</td>
<td>83.97</td>
<td>84.67</td>
<td>8.82</td>
<td>8.91</td>
<td>35.73</td>
<td>35.68</td>
<td>32.92</td>
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<tr>
<td>CD at 5%</td>
<td>1.286</td>
<td>0.741</td>
<td>0.226</td>
<td>0.192</td>
<td>0.070</td>
<td>0.056</td>
<td>0.242</td>
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<td>Inorganic fertilizers</td>
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<td>N₀ (No fertilizers)</td>
<td>71.53</td>
<td>71.48</td>
<td>7.36</td>
<td>7.31</td>
<td>38.91</td>
<td>38.65</td>
<td>19.33</td>
</tr>
<tr>
<td>N₁ (40 kg N + 20 kg P/ha)</td>
<td>80.86</td>
<td>80.79</td>
<td>8.25</td>
<td>8.35</td>
<td>36.05</td>
<td>35.81</td>
<td>28.43</td>
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<tr>
<td>N₂ (80 kg N + 40 kg P/ha)</td>
<td>88.56</td>
<td>89.63</td>
<td>9.33</td>
<td>9.46</td>
<td>34.73</td>
<td>34.78</td>
<td>37.30</td>
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<tr>
<td>N₃ (1120 kg N + 60 kg P/ha)</td>
<td>95.85</td>
<td>95.71</td>
<td>9.90</td>
<td>9.95</td>
<td>33.96</td>
<td>34.08</td>
<td>40.51</td>
</tr>
<tr>
<td>CD at 5%</td>
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<td>0.192</td>
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</table>

RESULTS AND DISCUSSION

EFFECT OF BIO-FERTILIZERS

Application of Azotobacter, Azospirillum and Phosphobacteria played a significant role in influencing the plant growth, number of primary branches, days taken to first flowering, number of fruits per plant, average fruit weight, total soluble solid and ascorbic acid were maximum with the application of Azospirillum followed by Azotobacter. Possible reasons for increased plant growth, yield and fruit quality attributed to better inorganic nitrogen utilization in the presence of bio-fertilizers, enhanced biological N-fixation, better synthesis of plant growth hormones.

EFFECT OF INORGANIC FERTILIZERS

With every additional dose of nitrogen, phosphorus and potash these were corresponding significantly increase plant growth, yield and fruit quality during 2003 and 2004. The maximum values were recorded at 120 kg N + 60 kg P + 60 kg K/ha having significant differences over the control. The justification for enhanced plant growth, yield and quality of tomato may be that the nitrogen plays a major role in the synthesis of chlorophyll and amino acids which constitute the building blocks of protein enhance its application might have resulted in the development of robust plants and ultimately higher plant growth, yield and fruit quality.

INTERACTION EFFECT
The combined effect of inorganic and bio-fertilizers application was found significant with respect to plant growth and yield which was highest at a treatment combination of B2N3 (Azospirillum with 120 kg N+60 kg P+60 kg K/ha) and it was significantly better than rest of the treatment combinations during 2003 and 2004.

REFERENCES


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